Table 1. Annual Per Capita Consumption Estimates[a] for the U.S. for Fish and Shellfish Based on Food Disappearance into Commercial Markets

Fishery Product	Year	Pounds/Yr	Grams/day
Finfish (fresh and frozen)	1987	6.0	7.5
	1991	6.0	7.5
	1993	6.3	7.8
Shellfish (fresh and frozen)	1987	4.0	4.9
	1991	3.7	4.6
	1993	3.9	4.9
Combined Finfish and Shellfish (fresh, frozen, canned and cured)	1960	10.3	12.8
	1970	11.8	14.7
	1980	12.5	15.5
	1987[b]	16.2	20.1
	1990	15.0	18.7
	1993	15.0	18.7

Source: NMFS (1994)

[a] Quantities of commercial seafood available for consumption were derived by deducting exports, inventory changes, and nonfood use from data on production, imports and beginning inventories for fresh, frozen, canned, and cured commercial fishery products. Calculated per capita rates were based on an "edible weight basis." Civilian population size was estimated at the middle of the census period.

[b] record year

Table 2. Per Capita Consumption Rates (g/day) for Fish and Shellfish in the U.S. Based on National Surveys

Survey	Median	Mean	Upper %	Reference
1969-70 Market Facts Consumer Panel Survey		14	77 (99th) 165 (99.9th)	Finch (1973)
		16.8[a]		Hu (1985)
1973-74 National Purchase Diary (NPD)		18.7[b]		Cordle et al. (1978)
		14.3	41.7 (95th)	Javitz (1980)
		15.3[a]		Hu (1985)
		12.8[c]		Rupp et al. (1980)
	7.3	15.8[c]	39.8 (90th)	Ruffle et al. (1994)
1981 NMFS Market Research Corporation of America (MRCA)		8.1[b]		Hu (1985)
1977-78 USDA National Food Consumption Survey (NFCS)		12		USDA (1983)
		17.9[a]		Hu (1985)
1987-88 USDA National Food Consumption Survey (NFCS)		11[b]		USDA (1993)
1989-91 USDA CSFII		13[d]		USDA (1994)
	0	16	78 (95th)	U.S. EPA[e]

[a] "at-home" consumption
[b] value considered invalid or unreliable
[c] derived by summing average rates for each category (*i.e.*, freshwater, saltwater, and shellfish)
[d] based on one-day intake records, preliminary results
[e] unpublished results, communicated by Helen Jacobs, 6/97

Table 3a. Annual Consumption of Fish and Shellfish in the U.S.

Target Population	Freshwater Finfish		Saltwater Finfish		Shellfish	
	kg/yr	g/day	kg/yr	g/day	kg/yr	g/day
Per capita rate for U.S.	0.43	1.2	3.2	8.8	1.01	2.8
Per capita rate for U.S. consumers	2.43	6.7	3.52	9.6	2.91	8.0
Per capita rate for U.S. adult consumers	3.41	9.3	3.52[a]	9.6[a]	3.06	8.4

Source: 1973-74 National Purchase Diary (NPD) Survey (Rupp et al., 1980)

Table 3b. Regional Summary of the Average Per Capita Consumption Rate of Fish and Shellfish (kg/yr) and Percent Users (Adults Only)

Census region	Freshwater Fish	% Users	Saltwater Fish	% Users	Shellfish	% Users
U.S.	0.43	15.9	3.20	90.0	1.01	41.5
New England	0.08	5.1	3.78	93.4	1.69	59.6
Mid Atlantic	0.27	10.6	3.67	92.2	1.06	44.3
S. Atlantic	0.33	12.4	3.43	89.2	1.43	49.6
E. S. Central	0.70	23.7	2.87	89.5	0.82	34.5
E. N. Central	0.56	18.9	2.97	88.0	0.61	29.5
W. N. Central	0.64	22.4	2.58	31.1	0.60	31.1
W. S. Central	0.84	25.0	2.97	88.7	1.14	39.4
Mountain	0.46	17.0	2.73	88.2	0.79	42.2
Pacific	0.33	14.1	3.51	91.2	1.16	49.2

Source: 1973-74 National Purchase Diary (NPD) Survey (Rupp et al., 1980)

Table 3c. Per capita fish and shellfish consumption rates (g/day) for adults in the U.S. and the Pacific Region

Type	All regions			Pacific region		
	median	mean	90th%	median	mean	90th%
Freshwater fish	0	1.48	5.12	0	1.07	4.05
Saltwater fish	7.29	10.68	23.73	7.84	11.37	25.59
Shellfish	0	3.59	10.96	0	4.05	11.64

Source: 1973-74 NPD Survey (Ruffle et al., 1994)

[a] An annual rate for adult consumers of saltwater fish was not given. Rupp et al. (1980) reported that this amount was not much different from the per capita rate for all consumers, thus, 3.52 kg/yr was used for these estimates.

Table 4a. 1985-86 USDA Continuing Survey of Food Intake of Individuals (CSFII) Combined Fish and Shellfish Per Capita Consumption Rates (g/day)

Time period/ days sampled	Population sampled[a]	Mean	Reported users (%)	Source
Summer 1985 1 day	men	21	11	USDA (1986b) No. 85-3
Spring 1985 1 day	women	13	11.5	USDA (1985) No. 85-1
Spring 1986 1 day	women	11	10	USDA (1987b) No. 86-1
1985 4 nonconsecutive days	women	11	32.8[b]	USDA (1987a) No. 85-4
1986 4 nonconsecutive days	women	12	30.4[b]	USDA (1988) No. 86-3
Spring 1985 1 day	low income women	11	7.5	USDA (1986a) No. 85-2
Spring 1986 1 day	low income women	9	8	USDA (1987c) No. 86-2
1985 4 nonconsecutive days	low income women	9	23.3[b]	USDA (1988a) No. 85-5
1986 4 nonconsecutive days	low income women	9	26.2[b]	USDA (1989) No. 86-4
1985-86 3 days	women	20.4[c]	44.7	Popkin et al. (1989)

Table 4b. 1989-91 USDA Continuing Survey of Food Intake of Individuals (CSFII)[d] Combined Fish and Shellfish Per Capita Consumption Rates, (g/day)

Population sampled	Mean rate	Reported users (%)	Source
men $\geq$ 20 yrs	17	11	USDA (1994)[e]
women $\geq$ 20yrs	14	10.9	USDA (1994)
all individuals	13	9.6[f]	USDA (1994)
all individuals	16	*	U.S. EPA[g]

* not reported

[a] All groups were aged 19-50 years
[b] using at least once
[c] includes seafood in mixed dishes
[d] preliminary results
[e] data from one-day
[f] Reported using on day of interview
[g] Unpublished results, communicated by Helen Jacobs, 6/97

Table 5. "Consumer-Only" Consumption Rates (g/day) for Fish and Shellfish Combined

Survey (Reference)	Median	Mean	90th Percentile	95th Percentile
1977-78 NFCS (Pao et al., 1982)	37	48	94	128
1977-78 NFCS (Popkin et al., 1989[a])	*	111.0	*	*
1985-86 CSFII (Popkin et al., 1989[a])	*	88.2	*	*
1989-91 CSFII (U.S. EPA[b])	0	100.6	197.4	253.4

* not reported

[a] Consumption rates derived for women aged 19-50 years
[b] Unpublished results, communicated by Helen Jacobs, 6/97

Table 6. Fish Consumption Rates for Fishers - Self-Caught and Commercial Fish (g/day)

Survey (Source)	Fish Category	Mean	Upper Level Intake (%)
1988 Michigan Sport Anglers Fish Consumption Study (West et al., 1989)	Total Fish	16.1[a]	75 (96th)
1991-92 Michigan Sport Anglers Fish Consumption Study (West et al., 1993)	Sport Fish Total Fish	14.5[a] 24.3[a]	81.6 (96th) 102.0 (95th)
1988 New York Statewide Angler Survey (NYSDEC, 1990)	Total Fish	28.1[b]	*
Wisconsin Angler Study (Fiore et al., 1989)	Sport Fish Total Fish	12.3 26.1	37.3 (95th) 63.4 (95th)

* not reported

[a] Adjusted downward by 2.2 g for nonresponse
[b] Value based on 45.2 meals/year and half pound portions of fish per meal.

Table 7. Self-Caught and Commercial Fish Consumption Rates (g/day) by Ethnic Group and Overall

1988 Michigan Sport Angler Study - West et al. (1989)

Ethnic Group	Number in Group	Mean
Black	69	20.3
Native American	139	24.3
Other minorities (Hispanics, mixed, other)	123	17.9
White	3339	17.9
Total	3670	18.3

1991-92 Michigan Sport Angler Survey - West et al. (1993)

Ethnic Group	Number in Group	Mean Sport Fish	Mean Total Fish
Minorities[a]	160	23.2	35.9
White	2289	16.3	25.9
Total	2450	16.7	26.6

[a] Includes Blacks and Native Americans.

Table 8. 1988 Michigan Sport Anglers Fish Consumption Study - Murray and Burmaster (1994)

Population group	Number in group	Fish consumed	Median	Mean	95th%
All/ate fish	1061	Total fish	32.7	45.3	103.9
Females/ate fish	474	Total fish	32.7	42.3	85.7
Males/ate fish	587	Total fish	32.7	47.8	106.1
Anglers/ate fish	511	Total fish	32.7	47.9	106.1
All/ate self-caught fish	418	Total fish	40.8	50.2	106.1
All/ate self-caught fish	418	Self-caught	32.7	42.3	98.0
Anglers/ate self-caught fish	191	Total fish	40.8	55.1	114.3
Anglers/ate self-caught fish	191	Self-caught	32.7	45.0	98.0
All/ate Great Lakes fish	188	Total fish	40.8	54.8	122.4
All/ate Great Lakes fish	188	Great Lakes	32.7	38.5	81.6
Anglers/ate Great Lakes fish	89	Total fish	53.1	61.3	123.9
Anglers/ate Great Lakes fish	89	Great Lakes	32.7	40.9	81.6

Table 9. Self-Caught Fish Consumption Rates (g/day) in Santa Monica Bay by Ethnic Group and Overall

SCCWRP and MBC (1994)

Ethnic Group	Number in Group	Median	Mean	Upper Level Intake (90th%)
White	217	21.4	58.1	112.5
Hispanic	137	16.1	28.2	64.3
Black	57	24.1	48.6	85.7
Asian	122	21.4	51.1	115.7
Other	14	85.7	137.3	173.6
All	555	21.4	49.6	107.1

Hill and Lee (1995)

Ethnic Group	Number in Group	Median	Mean	Upper Level Intake (95th%)
White	216*	21.4	50.0	160.7
Hispanic	137	16.1	28.2	85.7
Black	57	24.1	48.6	225.0
Asian/Other	136	21.4	60.0	192.9
All	554*	21.4	46.4	160.7

***** outlier removed

Hill (1995)

Ethnic Group	Number in Group (N)	Mean	Standard Deviation (SD)
Other	14	137.3	175.96
Filipino	39	66.63	168.53
White	217	58.11	143.25
Chinese	18	55.51	73.30
Korean	28	50.41	59.48
Black	57	48.61	72.79
Japanese	30	34.51	42.43
Hispanic	137	28.20	35.06
Vietnamese	7	27.93	35.00

Distribution of Consumption Rates for Santa Monica Bay (g/day)**

			Percentile Total Consumption Rates													
N	**Mean**	**SD**	**5**	**10**	**20**	**25**	**30**	**40**	**50**	**60**	**70**	**75**	**80**	**90**	**95**	**99**
553	50	111	5	5	11	11	11	16	21	24	40	48	64	107	161	407

****adapted from Hill and Lee (1995)**

Table 10. Self-Caught Fish Consumption Rates (g/day) by Ethnic Group

Los Angeles Metropolitan Area - Puffer et al. (1980)

Ethnic Group	Number in Group	Median	Mean	Upper Level Intake (90th%)
White	445	46	*	*
Mex.-American	169	33	*	*
Black	254	24.2	*	*
Oriental/Samoan	138	70.6	*	*
Other	53	*	*	*
All	1059	36.9	*	224.8

San Diego Bay - San Diego County Health Department (1990)

Ethnic Group	Number in Group	Median	Mean	Upper Level Intake (95th%)
White	20	*	10.8	*
Filipino	26	*	49.5	*
Asian	4	*	81.9	*
Hispanic	5	*	23.6	*
All	59	*	31.2	73.4

* not reported

Puget Sound Embayments - Landolt et al. (1985)

Ethnic Group	Geometric Mean[a]
Overall Non-U.S. born Asian	10
Non-U.S. born Filipino	8
Non-U.S. born SE Asian	11
Non-U.S. born Chinese/Japanese	8
U.S. born Caucasian	11
U.S. born Black	9
U.S. born Asian	10
Overall	11

Columbia River Basin - CRITFC (1994)

Ethnic Group	Number in Group	Mean	Upper level intake (%)
Native American (4 tribes)	513	63.2[b]	170 (95th%)

[a] Consumption rates are expressed as the geometric mean grams of cleaned fish available for consumption per person per day.

[b] This rate was reported for adult consumers only, representing 93% of the adult population, compared to 58.7 g/day for fish consumers and non-fish consumers (adults) combined.

Table 11. Fish and Shellfish Consumption Studies of Freshwater Fishing Populations

Survey	Study method/ # respondents	Geography	Target Population	Demographic variables	Type of consumption	Mean rate of consumption (g/day)	Type of rate	Comments
1988 Michigan Statewide	mail 1230	Great Lakes and rivers flowing in	licensed anglers	race; income; education; residence	sport and commercial combined	18.3 (16.1[a])	GPD per household member	7-day recall
1991-92 Michigan Sport Anglers	mail 3276	Great Lakes and rivers flowing in	licensed anglers	race; income; education; residence	sport and commercial	14.5[a] (sport) 24.3[a] (total)	per fisher	7-day recall
1988 NY Statewide Angler	mail 1190	state waters	licensed anglers	age; income; education	total and sport[b] meals	28.1 (total)	per angler	reported meals/yr assumed 8 oz/meal
1985 Wisconsin Angler	mail 801	state waters	licensed anglers (in counties with fish advisories)		sport and total meals	12.3 (sport) 26.1 (total)	per angler	derived from meals/yr assumed 8 oz/meal
1990 Maine	mail 1612	freshwater (lake, pond, river, stream)	licensed anglers		sport	6.5	per household member	recall for ice fishing or open water seasons

[a] adjusted for nonresponse
[b] limited information provided for sport fish taken from Lake Ontario

Table 12. Fish and Shellfish Consumption Studies of Native American Fishing Populations (West coast)

Survey	Study method/ # respondents	Geography	Target Population	Demographic variables	Type of consumption	Mean rate of consumption (g/day)	Type of rate	Comments
1991-92 Columbia River Basin	mail/interview 513	Columbia River	Umatilla, Nez Perce, Yakama, Warm Springs tribes		sport	63.2 (58.7)	adult consumers (per capita)	
1992 Clear Lake, California	interview 68	Clear Lake	Elem tribe (63)and other residents (5)		sport and commercial	60 (sport) 24 (commer-cial)	consumers	nonreservation

Table 13. Fish Consumption Values (g/day) Cited in U.S. EPA Documents

Source	Median	Mean	90th%	95th%	Use for	Based on	Comments
1989 Exposure Factors Handbook	30		140		recreational fishers	averaged results from Pierce, et al. (1981) and Puffer, et al. (1982)	
1989 Risk Assessment Guidance for Superfund Vol. I, Part A (RAGS)	38 (averaged over 3 days)			132	finfish consumers (residential exposure)	Pao, et al. (1982) (1977-78 USDA NFCS)	recommended ingestion rates: 0.113 kg/meal (50th%) 0.284 kg/meal (95th%) 6.5 g/day (ave over 1 yr)
1991 RAGS Supplemental Guidance		54 (2 meals/wk)		132 (4 meals/wk)	recreational fishers subsistence fishers	Pao, et al. (1982) (1977-78 USDA NFCS)	assumed 8 oz. per meal

Table 14. Fish and Shellfish Consumption Studies of Marine or Estuarine Fishing Populations

Survey	Study method/ # respondents	Geography	Target Population	Demographic variables	Type of consumption	Mean rate of consumption (g/day)	Type of rate	Comments/ caveats
1991-92 Santa Monica Bay Seafood Consumption	creel/recall 554	Santa Monica Bay	fishers	age, sex, ethnicity, income	sport	49.6	per angler	
1980 Los Angeles Metropolitan	creel 1059	Santa Monica Bay	fishers and households	age, sex, ethnicity	sport	NA	per household member	reported median rate of 37 g/day
1988-89 San Diego Bay	creel 59	San Diego Bay	anglers and household	ethnicity	sport	31.2	bay-wide mean	
1980 Commence-ment Bay	creel/telephone followup 504	Commence-ment Bay	fishers and household	ethnicity	sport	?	per household member	reported edible catch as 453 g/d inclu. boaters exclu. salmon
1983-84 Puget Sound	creel 4437	Puget Sound	fishers	age; race; education; employment	sport	NA	per household member	reported geometric mean of 11 g/day

Table 15. Mean Per Capita Consumption Rates for Fish and Shellfish (Combined) (g/day) by Race or Ethnic Group

Survey (Reference)	Black	White	Oriental	Other	Overall
1969-70 Market Facts, Inc. (Nash, 1971)		15.27	*	20.05	16.8
1973-74 NPD (Javitz, 1980)	16.0	14.2	21.0	13.2	14.3
1977-78 NFCS (Hu, 1985)	20.01	16.97	*	20.32	17.9
1981 MRCA (Hu, 1985)	7.52	8.12	*	11.09	8.12

* no data were available

Table 16a. Mean National Per Capita Fish and Shellfish Consumption Rates (g/day) by Age and Sex Based on the 1973-74 NPD

Source	Age	Male	Female	Male & Female
Rupp et al. (1980)[a]				
	1-11	*	*	5.8
	12-18	*	*	9.5
	19+	*	*	15.8
Javitz (1980)				
	0-9	6.3	6.1	6.2
	10-19	11.2	9.0	10.1
	20-29	16.1	13.4	14.5
	30-39	17.0	14.9	15.8
	40-49	18.2	16.7	17.4
	50-59	22.8	19.5	20.9
	60-69	24.4	19.0	21.7
	70+	15.8	10.0	13.3

[*] Indicates no data were available.

[a] Consumption rates for the "Male and Female" column were derived by summing the given average rates for freshwater and saltwater finfish and shellfish.

Table 16b. Mean Per Capita Fish and Shellfish Consumption Rates (g/day) by Age and Sex Based on the 1977-78 USDA NFCS

Source	Age	Male	Female	Male & Female
USDA (1983)[a]				
	<1	*	*	0-0.5
	1-2	*	*	4
	3-5	*	*	6
	6-8	*	*	7
	9-11	8	4	5.9
	12-14	9	9	9
	15-18	10	11	10.5
	19-22	14	11	12.3
	23-34	16	11	13.1
	35-50	15	13	13.8
	51-64	18	14	15.7
	65-74	17	12	14.2
	75+	10	8	8.8
USDA (1983)				
	0-11	*	*	5.6
	12-18	9.6	10.1	9.8
	19+	15.8	12.1	13.6

* not reported

[a] Following the 6-8 age category, consumption rates for each age interval in the "Male and Female" column were derived by the formula: {[(male sample size)x(male rate of consumption)]+[(female sample size)x(female rate of consumption)]}/(male sample size+female sample size). Rates do not incorporate breast-fed infants.

Table 16c. Mean Per Capita Fish and Shellfish Consumption Rates (g/day) by Age and Sex Based on the 1989-91 USDA CSFII [a](1 Day)

Survey/Source	Age	Male	Female	Male & Female
USDA (1994)				
	1-2	2	3	2
	3-5	5	4	4
	6-11	10	9	*
	12-29	7	6	*
	20-29	12	8	*
	30-39	15	13	*
	40-49	25	19	*
	50-59	19	14	*
	60-69	21	19	*
	70-79	18	14	*
	80+	3	18	*
	20+	17	13	*
	Total	*	*	13

* not reported

[a] Preliminary results

Table 17. Mean National Fish and Shellfish Consumption Rates (g/day) for Consumers by Age and Sex

Age	Male	Female	Male & Female
<1	*	*	15
1-2	*	*	22
3-5	*	*	27
6-8	*	*	32
9-14	40	33	*
15-18	46	45	*
19-34	62	44	*
35-64	62	49	*
65-74	62	50	*
75+	51	45	*

* not reported

Source: Pao et al. (1982) based on the 1977-78 USDA NFCS